SUPPLEMENT

TO

THE MEDICAL JOURNAL OF AUSTRALIA

SYDNEY, SATURDAY, APRIL 19, 1924.

Section IV.—Pathology and Bacteriology.

(Continued.)

DR. TEBBUTT referred to the work on the diagnosis and serum treatment of pneumonia which had been carried out by Miss Ross and himself and compared their figures with those of the workers at the Melbourne Hospital.

The maximum incidence in their series was between the ages of 20 and 30. Of the total cases under the age of two lobar pneumonia occurred in 3.3% and bronchopneumonia in 28%. The mortality in the years 1910 to 1921 was 17.1%. The mortality among 1,533 lobar cases was 17% and in 690 bronchopneumonia cases 15.5%. Empyema occurred in 8.7% of the cases of lobar pneumonia at the Prince Alfred Hospital which approximated to the figure of 8.6% of the Melbourne Hospital. He thought that it would be very interesting to compare these figures with those from Brisbane. He quoted some figures and hypotheses of Anders who considers that the main influence of the seasons is indirect and is due in large measure to variations in virulence and to the greater concentration of the infecting agent as a result of the unhygienic habits of living so much in vogue in the form of ill ventilated rooms during the winter time. The speaker thought that in all probability Sydney inhabitants lived more in the open air and that pneumonic infection was not so prevalent there. With regard to the serum method of treatment this began in July, 1922. Polyvalent sera were used throughout and treatment latterly had been instigated in most cases before the bacteriological diagnosis was completed. There had been some very severe reactions in the early cases and it was not till the serum was well diluted and given slowly that these were avoided. He was unable to come to any general conclusions as regards the efficacy of serum treatment. Of cases treated with polyvalent sera 15 Group (1) cases had one death, two group (3) cases died out of three treated and of 1 group (4) cases 3 died. There was no evidence that he could bring forward either in favour of or against serum treatment.

DR. PENFOLD described a study of 108 strains of pneumococci which had been undertaken at the Serum Laboratories. These were typed and the following percentage figures obtained. Group (1) 37%, Group (2) 7.2%, Group (3) 9%, Group (4) 10% and in the heterogeneous group 36.8%.

He stressed the great frequency of the heterogeneous group and the serological complexity of it. All these factors make it extremely difficult to manufacture a good serum. He was extremely disappointed to hear the remarks of the preceding speakers of the results of serum treatment and thought that many factors had been disregarded and that the serum treatment had not had a fair therapeutic chance. He deplored the lack of correlation between the pathologist and the immunologist and the clinician and hoped that in the future this would be improved.

DR. BULL agreed with many of the remarks of Dr. Penfold and stated that he believed that the extreme complexity of the serological types was the cause of the unhappy results of various workers. He asked if any recent work had been performed on the use of vaccines in pneumonia and quoted two cases in which he believed that good results had been obtained.

DR. SHEARMAN was interested to hear of the disappointing results of treatment with polyvalent sera and asked if there had been any investigation of the effect of monovalent sera. He thought that there should be a much more general administration than the reported figures showed.

PROFESSOR CLELAND suggested that the difficulty of correlation between the research workers and the clinicians would be met by the instigation of clinical units in the big hospitals.

Tuberculosis.

After keen discussion the following memorandum submitted by Dr. W. J. Penfold was unanimously adopted as the opinion of the Section.

Since bovine tuberculosis constitutes in Victoria approximately one-fourth of the tuberculosis in the cases investigated during the first four years of childhood, it is in the opinion of this Section an important practical problem of preventive medicine and this Section believes that it can be most effectively dealt with by compelling dairymen either: (*a*) to clear their herds of tuberculous animals by means of the tuberculin test or (*b*) to Pasteurize or have Pasteurized to the satisfaction of the sanitary authority all their milk for human consumption. This may necessitate a small rise in the price of milk, but this Section believes that such a rise would be legitimate in the interests of the children.

Tuberculosis due to the human type of bacillus is a much bigger problem than bovine tuberculosis in the human subject.

This Section believes that the most promising way to handle it is to classify the tuberculous according to their degree of infectivity and to give to those who are highly infectious, the right to farm settlement or hospital benefit. If any attempt is made to compel these people to go into either of such institutions, so much opposition will be engendered that valuable preventive work will be nipped in the bud, but if such benefit is to be accepted or rejected by them at their own option, the probability is that great numbers will avail themselves of it.

The degree of infectivity will depend upon the number of tubercle bacilli that the particular patient is excreting, his sense of responsibility in respect of his infected discharges, his education, his home surroundings, the type of

contacts (more especially little children) living in the same house and many other factors, so that some referee or referees representing the authority supplying the benefit would be required to classify the patients.

Such patients—at least in the farm settlement—would probably be able to do only a fraction of a day's work. That fraction should be determined by the medical officer in charge, but in each case the individual should be paid the standard rate of wages as if he were working a full day, so that any dependants he might have, would not be prejudiced by reason of his treatment. The question arises as to whether it would not be a wise preventive medicine proposition to pay the standard rate of wages to hospital patients also, even though they are not able to work at all. Otherwise they are likely to return to their homes, to be supported by their relatives. Under these circumstances home conditions would be bad, the overworked relatives would at the same time be unduly exposed to infection and great evil would result from the arrangement. We believe, therefore, as a Section, that patients in the hospital stage of tuberculosis should also be granted the standard rate of wages. Such favourable conditions for patients and their dependants would be found nowhere else in our society and they would naturally be availed of.

It is the opinion of this Section that in view of the very great difficulty experienced by hospital pathologists in conducting research studies by reason of the pressure of routine work, special provision should be made for the accurate investigation of the incidence of tuberculosis.

It is very desirable that the Commonwealth of Australia should set apart a highly trained and efficient personnel for research work upon methods for the effective treatment and control of this disease.

THE PRESIDENT'S address on disease in the Australian aboriginal was delivered by PROFESSOR J. B. CLELAND.

IRREGULARITIES IN ISO-AGGLUTINATION.

By A. H. TEBBUTT, B.A., M.B., D.P.H.,

Honorary Director of the Pathological Department, Royal Prince Alfred Hospital, Sydney.

THE elucidation of some puzzling agglutination results at the Johns Hopkins Hospital by Guthrie and Huck (1) has added fresh interest to this subject. They have produced satisfactory evidence of the existence of variants from the four well established groups and even of a third agglutinin (c)) and its red cell receptor. I was interested to discover how many sera would have to be cross-agglutinated before irregularity would appear. Sera and corpuscles were collected from people suffering from various ailments, but not confined to bed, and were cross-agglutinated in batches, known Group II. and III. sera and corpuscles being used as controls. The first eight yielded no irregularities nor did the next nine nor a further sixteen, but the third patient in the next batch of eleven (see Table I.), that is to say, the thirty-third in the series yielded corpuscles which were agglutinated by several Group (Jansky) I. and II. sera, but his serum did not agglutinate the red cells of a number of Group II. patients which it was required to do before it could be placed in Group III. The blood of this patient behaved similarly in this respect to Guthrie and Huck's patient C.T. My patient was a man of over seventy years and it was not possible to discover whether it was an hereditary quality as did Guthrie and Huck. These workers found a condition called sickle cell anæmia cropping up in the same family and apparently also congenital.

Speaking of irregularities in general and of their bearing on the ethnological data already collected, I am not disposed to think that much revision will be necessary, but the discovery of a third agglutinin (e) may have important ethnological relations, though rendering the Mendelian explanation exceedingly complex. It is too early yet perhaps to see these new data in their true perspective, but it seems to me possible that a blood formula B-o (receptor B present, agglutinin a absent) might be explained either (i.) as an atrophy of a physiological quality of the blood serum or (ii.) a congenital condition parallel with a congenital deficiency of some anatomical structure. In support of (i.) we know that these agglutinins vary considerably in normal titre and that they may in some instances go to the vanishing point has not been proved but is possible. With regard to (ii.) Guthrie and Huck's variant was found in three other people among ten collaterals.

TABLE I.—CROSS AGGLUTINATION (Iso-agglutination).
Eleven persons; one Irregularity=B–o.

Serum		Corpuscles												
Source	Group	H(I)	McM(II)	Ca(?)	Cul(III)	McC (I)	D (II)	E(III)	Wi(I)	P (I)	Cun (III)	Wi(I)	Tebbutt(II)	Utz (III)
H	I	–	+	+	+	–	+	+	–	–	+	–	+	+
McM	II	–	–	+	+	–	–	+	–	–	+	–	–	+
Ca	?	–	–	–	–	–	–	–	–	–	–	–	–	–
Cul	III	–	+	–	–	–	+	–	–	–	–	–	+	–
McC	I	–	+	+	+	–	+	+	–	–	+	–	+	+
D	II.	–	–	+	+	–	–	+	–	–	+	–	–	+
E	III.	–	+	–	–	–	+	–	–	–	–	–	+	–
W	I.	–	+	+	+	–	+	+	–	–	+	–	+	+
P	I.	–	+	+	+	–	+	+	–	–	+	–	+	+
Cun	III	–	+	–	–	–	+	–	–	–	–	–	+	–
Wi	I	–	+	+	+	–	+	+	–	–	+	–	+	+
(Tebbutt)	II.	–	–	+	+	–	–	+	–	–	+	–	–	+
(Utz)	III	–	+	–	–	–	+	–	–	–	–	–	+	–

Group I=ab; Group II=Ab; Group III=Ba; Group IV=A–B; Ca=B–o (Possibly B–c).

I would like to state that in examining full blooded aboriginals I have always, fortunately, examined both corpuscles and sera, which is certainly more convincing than examining corpuscles only by the method of Moss.

With regard to other irregularities I have only noted that the sera of some few aboriginals whose corpuscles presumably belong to Group I. (Jansky), agglutinate very weakly or even doubtfully the corpuscles of known Group II. and III. Of eighty-three individuals placed in Group I. by the method of Moss, the sera of two agglutinated very weakly the corpuscles of Group II. and doubtfully, if at all, the corpuscles of Group III. tending to O-a instead of O-ab).

I have to acknowledge my indebtedness to Dr. Leslie Utz for supplies of his own blood on many occasions.

Reference.

(1) C. G. Guthrie and J. G. Huck, *Bulletin of the Johns Hopkins Hospital,* 1923, Vol. XXXIV.

THE "BIOCHEMICAL INDEX" IN NATIVES OF THE TERRITORY OF NEW GUINEA.

By G. M. Heydon, M.B., Ch.M. (Syd.), D.P.H., D.T.H., and H. (Camb.),
and
T. W. Murphy, B.Sc. (Syd.).

This paper records the results of blood group determinations in 753 Melanesians, natives of the Mandated Territory of New Guinea, which have been carried out at the laboratory of the Commonwealth Department of Health in Rabaul.

The natives were all males and most of them adults; none were under ten years of age.

The method of Moss was used. It may be that this method which consists merely in mixing the corpuscles to be tested with a Group II. and a Group III. serum from any two individuals known to belong to these groups, is not entirely satisfactory and possibly does not give complete information. For instance, Guthriea nd Huck (1) believe that a third iso-hæmorrhage agglutinin and its corresponding agglutinogen are present in human blood. However this may be, Moss's method which has been widely used, certainly gives results of interest and may later turn out to be of great ethnological value.

The exact technique used was as follows. Half a cubic centimetre or less of blood was drawn from an arm vein into a hypodermic syringe containing a little 3.8% sodium citrate solution, whence it was transferred to a tube containing a few cubic centimetres of the same solution, with which it was mixed. On arrival at the laboratory the mixture was transferred to a test tube in which it was mixed with about twenty cubic centimetres of 0.85% sodium chloride solution. When the blood corpuscles had settled, the supernatant fluid was poured off and the corpuscles without further washing were well mixed with a Group II. and a Group III. serum on a glass slide. After not less than five minutes, during which the slide was kept in a Petri dish containing moist filter paper, thorough mixing was again obtained by movements of the slide and the result read; it was checked under the microscope when necessary.

Group II. and Group III. sera from twenty or thirty different individuals, chiefly natives, were used in these tests at different times. Some few sera were found to give ambiguous results with some corpuscles. When such occurred, another serum or serum of the same group was tried until a well defined result was obtained. With most sera this checking was hardly ever required. When any ambiguous results occurred in a batch of natives who were being tested, and alternative sera were not available, no selection was made of the well defined results, but the batch was discarded *in toto.*

These differences between sera of the same group and between corpuscles of the same group have been noticed and discussed by several observers. They are only incidentally mentioned here. As already mentioned, Moss's method, at any rate with unselected Group II. and Group III. sera, is perhaps open to some objection.

No risks were run of errors arising from deteriorated sera or corpuscles.

The following are the figures obtained.

Agglutinogens present (von Dungern & Hirschfeld's nomenclature).	Jansky's classification.	Number of natives tested.	Percentages.
O	Group I.	404	53.7
A	Group II.	202	26.8
B	Group III.	123	16.3
AB	Group IV.	24	3.2

Total number tested .. 753

The "biochemical index" (which is the ratio of A's to B's, that is the sum of Groups II. and IV. divided by the sum of Groups III. and IV.) works out at 1.54.

These 753 natives came from various parts of the Territory of New Guinea. In 581 of them record was kept of their native places. Natives of New Britain, and of various districts on the mainland of (late German) New Guinea formed the largest groups; other parts represented were Bougainville and Buka Islands (Solomon group), the Admiralty Islands and New Ireland. Some indications of probable differences in "biochemical index" between the natives from different parts of the Territory were revealed, but the figures for the separate districts so far got are insufficient to establish this satisfactorily.

So far as the writers know no previous observations on blood group percentages in Melanesians have been made. Their access to the literature, however, has been limited.

The Hirschfelds (2) divided the races they examined into three groups, a European type (index from 2.5 to 4.5), an intermediate type (index from 1.3 to 1.8) and an Asio-African type (index from 0.5 to 1.09). The index, 1.54, found in these Melanesians would put them in the Hirschfelds' intermediate type (which included Arabs, Turks, Russians and Jews). To this type also belong South African natives, of Bantu stock, with an index of 1.4 (2g0 tested), (3).

The Hirschfelds' third group included Malagasies, Senegalese, Annamese and Indians and of these the "Malagasies" with an index of 1.09 are nearest the Melanesians, while the West African Negroes and the Indians

differ widely. So do the Filipinos according to figures for 204 of them published by Cabrero and Wade (4), which give an index of 0.76. Chinese have an index of about 0.79 (Liu and Wang).

The Australian aboringines, although neighbours of the inhabitants of New Guinea, differ from them widely in anthropological characters and are considered to be a very ancient and long isolated race. With regard to them the very interesting fact has been established by Tebbutt (5) that they are near the extreme "European" end of the scale with a very high index.

References.

(1) C. G. Guthrie and J. G. Huck, *Bulletin of the Johns Hopkins Hospital,* February, March and April, 1923.

(2) L. and H. Hirschfeld, *The Lancet,* 1919, 675.

(3) J. H. H. Pirie, *The Medical Journal of South Africa,* January, 1921.

(4) C. Cabrera and H. W. Wade, *Journal of the Philippine Islands Medical Association,* May-June, 1921.

(5) A. H. Tebbutt, THE MEDICAL JOURNAL OF AUSTRALIA, February 25, 1922.

TYPES OF INFECTION IN LOBAR PNEUMONIA AND THE INFLUENCE OF SERUM TREATMENT.

By BEATRICE A. WARNER,
Melbourne Hospital.

IN continuation of the work published by Dr. S. W. Patterson in July, 1922, I have investigated, since that date, one hundred and forty-four cases of lobar pneumonia.

Serum treatment was given only to patients with Type I. infections and in order to shorten the period necessary for the determination of type, a short method, described by Griffith in Report No. 13 of the British Ministry of Health, was employed.

The organisms were isolated by injection into mice and by plating. By agglutination of the peritoneal fluid of mice inoculated eight to fifteen hours previously against type sera, the infecting organism could be classified. The results obtained were confirmed in all cases on the day following, by the agglutination of both cultures obtained from the heart blood or peritoneal fluid of the infected animal.

The diagnostic antisera used were prepared at the Walter and Eliza Hall Institute. The highest titres obtained for these against homologous organisms were 1 in 320, 1 in 1280, 1 in 640 for Types I., II. and III. respectively. Through the kindness of Drs. Penfold and Webster I was able to control the results obtained with these sera, by means of diagnostic sera prepared at the Commonwealth Serum Laboratories and at the New York State Department of Health.

The incidence of the various types of pneumococcus in my series of one hundred and forty-four cases, together with the mortality in each group, is given in the following table. They show general agreement with Dr. Patterson's figures for one hundred and forty-seven cases which are inserted here for comparison.

The mortality from Type I. infections was, however, much smaller in my series. The differences in mortality in other groups are accounted for by the small number of cases dealt with.

TABLE I.—Author's Series.

Infecting Organism	Patients		Deaths		Empyema	
	Number	%	Number	%	Number	%
Pneumococcus Type I	71	49.3	14	19.7	5	7
Pneumococcus Type II	14	9.7	1	7.1	2	14.3
Pneumococcus Type III	4	2.8	2	50	—	—
Unclassified	44	30.6	8	18.1	6	13.6
Streptococcus	10	7	1	10	2	20
Friedlander's bacillus	1	0.7	1	100	—	—
All organisms	144	100	27	18.7	15	10.4

TABLE II.—Dr. S. W. Patterson's Series.

Infecting Organisms	Patients		Deaths		Empyema	
	Number	%	Number	%	Number	%
Pneumococci Type I	63	43	21	33.3	7	11.1
Pneumococci Type II	14	9	2	14.3	—	—
Pneumococci Type III	7	47.5	1	14.3	—	—
Non-agglutinating Pneumococci	51	34.7	19	37	7	13.7
Streptococcus	12	8.1	6	50	2	16.6
All organisms	147	100	49	33.3	16	10.9

Among 521 patients with lobar pneumonia at the Melbourne Hospital in 1920, 1921 and part of 1922, Dr. Patterson found a mortality of 21.5%. During the period July, 1922 to June, 1923 two hundred and fourteen patients were admitted to the Melbourne Hospital with a mortality of 21%.

Comparison of the seasonal incidence of cases of lobar pneumonia due to pneumococcus Type I. in the year 1920 (Dr. Patterson's series) and the year 1922 (my own series) shows a remarkable agreement.

Year	February March, April	May, June, July	August September October	November December January
1920	26%	69%	43%	35%
1922	52%	69%	35%	29%

It is clear that the incidence of Type I. infections is greatest in the months of May, June, July (winter) during which the incidence of lobar pneumonia of all types is greatest.

The figures for the other types of infection are not

sufficiently large to permit of the determination of their seasonal incidence.

Treatment.

The serum used for treatment was monovalent Type I. serum prepared at the Commonwealth Serum Laboratories and the patients treated were selected at random.

Among fifty-five untreated Type I. patients the mortality was 20%; among fourteen patients treated with serum one died, mortality 7.1%.

The number of patients treated is small, but the result of treatment is at least encouraging.

The average duration of the disease in those untreated patients who survived without the occurrence of empyema, was 9.4 days, as against a duration of 9 days in treated patients.

The incidence of empyema was identical in the two groups of cases, 7%.

The average amount of serum exhibited in treated cases was 183 cubic centimetres. The largest amount given in any one patient was 450 cubic centimetres. Before administering the serum the sensitiveness of the patients was tested.

Four were found to be sensitive and were desensitized by the method recommended by the workers at the Rockefeller Institute. Two who did not react at first, reacted immediately to the intravenous injection of the serum.

In addition serum sickness of varying severity appearing on the ninth or tenth day was observed in three patients.

Section V.—Preventive Medicine and Tropical Hygiene.

STATISTICAL REVIEW OF TUBERCULOSIS IN AUSTRALIA.

By J. H. L. Cumpston, M.D., B.S., D.P.H.,
Commonwealth Director-General of Health.

Tuberculosis, including all forms of tuberculosis, stands fourth in order of the killing diseases, being responsible for one-sixteenth of the total deaths.

It represents for the community as a whole a loss during 1922 by death of 61 persons per hundred thousand of population, the rate for males, 71 per hundred thousand, being higher than that for females, 51 per hundred thousand. From pulmonary tuberculosis males had in 1922 a death-rate of 63, females a death-rate of 43, while the death-rate for both sexes combined is 53 per hundred thousand (see Table I.).

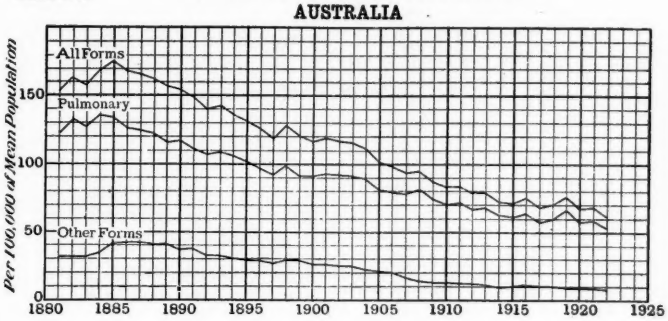
Comparison with other Countries.

The death-rate from pulmonary tuberculosis is lower (see Table IV.) in the Commonwealth than in any other country for which the information is available, with the single exception of New Zealand (see Table II.).

Table No 1

Death-rates from Tuberculosis

AUSTRALIA



Progress of the Disease.

During the last forty-two years (1881-1922) the death-rate from all forms of tuberculosis has fallen from a maximum of 175 (1885) to 61 (1922), the mean rate for 1921-1922 being only 39% of the mean for 1881-1890. Prior to 1907, however, the figures for forms of tuberculosis other than pulmonary should be used with caution, as "acute hydrocephalus" was then included in this group. For pulmonary tuberculosis, however, the figures are more reliable and the death-rate from this cause has fallen from a maximum of 135 in 1884 to 53 in 1922, the mean for 1921-22 being 44.8% of the mean for 1881-1890, representing a fall in the death-rate in forty-two years of 55.2% (see Table III.).

Progressive Rate of Decline.

The fall has, however, not been uniformly rapid. Table I. shows that from 1884 until 1917 there was a steady decline in the death-rate; between 1917 and 1921 there was a temporary increase which is seen also in New Zealand (see Table II.) and in England and Wales (see Table III.). This rise is generally attributed to war influences. The following table shows a comparison between the decennial periods.

Table A.

Percentage of Rate for each Decennium on Rate for 1881-1890 Pulmonary Tuberculosis in Commonwealth.

Decennium	Total (all persons)	Reduction on Previous Decennium
1881-1890	100.0	
1891-1900	80.0	20.0
1901-1910	66.4	13.6
1911-1920	51.2	15.2
1921-1222	44.8	5.4

From this table it is apparent that, even allowing for the temporary break in the continuity of the decline (1917-21), the rate of fall has been maintained to an encouraging degree.

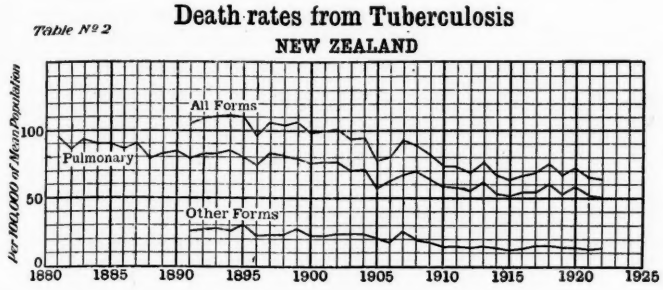
TABLE I.

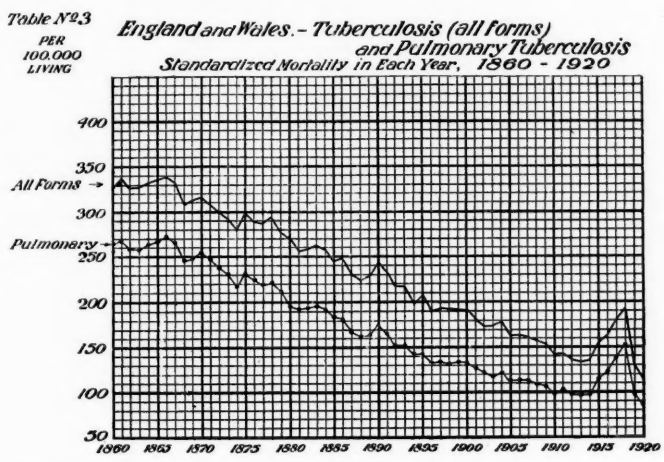
DEATHS FROM TUBERCULOSIS per 100,000 PERSONS.—AUSTRALIA, 1881–1922.

Year.	Pulmonary Tuberculosis			Other Forms of Tuberculosis			Tuberculosis, All Forms		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
1881	138	105	122	32	29	31	170	134	153
82	147	115	132	33	27	31	180	142	163
83	141	111	127	30	33	31	171	144	158
84	155	112	135	37	31	34	192	143	169
85	151	113	134	45	37	41	196	150	175
86	144	105	126	45	38	42	189	143	168
87	140	106	124	46	38	42	186	144	166
88	142	100	122	43	37	40	185	137	162
89	136	94	116	44	39	41	180	133	157
90	136	97	117	39	35	37	175	132	154
1881–1890 ...	**143**	**105**	**125**	**40**	**35**	**38**	**183**	**140**	**163**
1891	131	89	111	41	35	38	172	124	149
92	124	89	107	35	31	33	159	120	140
93	129	89	109	36	29	33	165	118	142
94	124	87	106	34	26	30	158	113	136
95	117	87	102	31	27	29	148	114	131
96	110	85	97	31	27	29	141	112	126
97	104	79	92	29	24	27	133	103	119
98	111	85	99	31	28	29	142	113	128
99	102	80	91	29	28	29	131	108	120
1900	104	77	91	28	23	26	132	100	117
1891–1900 ...	**115**	**84**	**100**	**32**	**28**	**30**	**147**	**112**	**130**
1901	105	81	93	28	23	26	133	104	119
02	105	78	92	27	22	25	132	100	117
03	101	79	91	26	24	25	127	103	116
04	98	81	89	22	21	22	120	102	111
05	92	69	81	21	19	20	113	88	101
06	88	70	79	21	19	20	109	89	99
07	84	71	78	16	16	16	100	87	94
08	86	77	81	14	12	14	100	89	95
09	80	67	74	13	13	13	93	80	87
10	76	64	70	13	12	13	89	76	83
1901–1910 ...	**91**	**73**	**83**	**20**	**18**	**19**	**111**	**91**	**102**
1911	76	69	71	12	13	12	88	78	83
12	74	61	67	12	11	12	86	72	79
13	74	60	68	11	12	11	85	72	79
14	72	53	63	10	8	9	82	61	72
15	69	54	61	10	10	10	79	64	71
16	75	54	64	11	10	11	86	64	75
17	70	47	58	12	8	10	82	55	68
18	71	50	60	11	9	10	82	59	70
19	80	54	67	10	8	9	90	62	76
20	69	47	58	10	8	9	79	55	67
1911–1920 ...	**73**	**54**	**64**	**11**	**10**	**10**	**84**	**64**	**74**
1921	68	48	59	10	8	9	78	56	68
22	63	43	53	8	8	8	71	51	61
1921–1922 ...	**66**	**45**	**56**	**9**	**8**	**9**	**75**	**53**	**65**

PERCENTAGE OF RATE FOR EACH DECENNIUM ON RATE FOR 1881–1890.

Year.	Pulmonary Tuberculosis			Other Forms of Tuberculosis			Tuberculosis, All Forms		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
	%	%	%	%	%	%	%	%	%
1881–1890 ...	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1891–1900 ...	80.4	80,0	80.0	80.0	80.0	78.9	80.3	80.0	79.7
1901–1910 ...	63.6	69.5	66.4	50.0	51.4	50.0	60.6	65.0	62.6
1911–1920 ..	51.0	51.4	51.2	27.5	28.6	26.3	45.9	45.7	45.4
1921–1922 ...	46.2	42.9	44.8	22.5	22.9	23.7	41.0	37.9	39.9





All that has been said above of pulmonary tuberculosis applies equally to "other forms of tuberculosis."

Age and Sex Distribution.

Consideration of the figures for "all forms of tuberculosis" for the Commonwealth (see Table VI.) shows that there is an initial elevation in the mortality in the under-five group for both sexes, a period of minimum and low mortality in both sexes between five and fourteen and thereafter a sharp rise in both sexes, continuing in females to a maximum at the 25-29 period and in males to a maximum at the 45-49 period. In females the mortality falls steadily from the 25-29 period to the 50-54 period, remaining then steady to the 65-69 period. In males the mortality remains high between the 40-44 period and the 65-69 period.

When the figures for "other forms of tuberculosis" are considered side by side with those for "all forms" and for "pulmonary tuberculosis," it is seen that the mortality under ten is accounted for almost entirely by the "other forms" and that this latter group ceases after ten years to be important and is significant also by reason of the identity in its behaviour in both sexes, thus contrasting strongly with the behaviour of pulmonary tuberculosis. Table 12 shows, however, the necessity for a guarded acceptance of the figures for the under-five group. From the table it is seen that of a total of 478 deaths under five years (1920-1922), 296 were attributed to tubercular meningitis, the diagnosis of which in the infant in the absence of a *post mortem* examination is very uncertain.

The behaviour of pulmonary tuberculosis differs in the two sexes. The female mortality is from birth to nine years less than the male; from ten to twenty-four it exceeds the male; from twenty-five to sixty-four it becomes increasingly less than the male, while from sixty-four onwards it is parallel in its course with, but at a lower level than, the male.

Tuberculosis and Occupation.

The grouping of males into occupational groups by the Commonwealth Statistician (see Tables VIII. and IX.) gives figures only for very large groups which have in this connexion little, if any, significance. It is necessary for the proper study of pulmonary tuberculosis in the Commonwealth that there should be available the material necessary for the compilation of a table of comparative occupational mortalities similar to those appended relating to England and Wales and to United States of America (see Tables X. and XI.).

Pulmonary Tuberculosis in Large Cities.

The figures are not available for all the large cities before 1900-1901 and in any comparison of the progress of the disease Adelaide must be excluded as the figures are available for Adelaide only from 1907 (see Table Va, Vb and Vc.).

The following table shows the comparison between the death-rates (per hundred thousand) in the cities shown for the periods 1900-1901 and 1920-1921. (For Ballarat and Bendigo the years 1901-1902 are shown instead of 1900-1901).

Amongst the capital cities Adelaide has now the highest tuberculosis mortality, the two other cities in the Commonwealth having a high mortality being Bendigo and Ballarat (two mining cities). The course of the disease during the past twenty years in the different cities is interesting. In Sydney, Melbourne, Brisbane, Perth and Ballarat the mortality rate has decreased by more than 40%. Even in Bendigo it has decreased by 36%. In Hobart, Launceston and Adelaide, on the contrary, it has diminished by less than 20% in Launceston having remained practically stationary for the last twenty years.

TABLE B.

	Mean Mortality 1900-1901	Mean Mortality 1920-1921	Percentage Reduction
Sydney	108	50	54
Melbourne	140	86	45
Brisbane	122	70	42
Perth	110	62	43
Hobart	97	80	18
Ballarat	158[1]	88	44
Bendigo	245[1]	156	36
Launceston	82	79	4
Adelaide	122[2]	101	18

1. 1901-1902. 2. 1907-1908.

Tuberculosis other than Pulmonary in Large Cities.

The table hereunder is similar to that for pulmonary tuberculosis in the material presented.

TABLE C.

	Mean Mortality 1900-1901	Mean Mortality 1920-1921	Percentage Reduction
Sydney	18.5	11	40.5
Melbourne	43.5	19	56.3
Brisbane	37	3.5	90.5
Adelaide	24[1]	16.5	31.3
Perth	21	15.5	36.2
Hobart	36.5	16	56.2
Ballarat	40[2]	16.5	58.8
Bendigo	54[2]	16.5	69.5
Launceston	35.5	19	46.5

1. 1907-1908. 2. 1901-1902.

TABLE II.

TUBERCULOSIS—DEATH RATE per 100,000 PERSONS. NEW ZEALAND, 1881–1922.

Year.	Pulmonary Tuberculosis.	Other Forms of Tuberculosis.	All Forms of Tuberculosis.
1881	95		
82	86		
83	94		
84	90	Not available.	Not available.
85	90		
86	86		
87	90		
88	79		
89	82		
90	84		
For 10 years.	**87**		
1891	79	26	105
92	82	27	109
93	82	28	110
94	85	26	111
95	80	30	110
96	74	22	96
97	83	23	106
98	81	23	104
99	79	27	106
1900	76	23	99
For 10 years.	**80**	**26**	**106**
1901	77	23	100
02	77	24	101
03	70	24	94
04	71	24	95
05	57	21	78
06	62	18	80
07	67	26	93
08	70	19	89
09	64	18	82
10	59	15	74
For 10 years.	**67**	**21**	**88**
1911	58	15	73
12	55	14	69
13	61	15	76
14	53	14	67
15	51	12	63
16	54	13	67
17	54	15	69
18	60	15	75
19	53	14	67
20	58	14	72
For 10 years.	**56**	**14**	**70**
1921 *	52	13	65
22	50	14	64
For 2 years.	**51**	**13**	**64**

TABLE III.

DEATH RATES per 100,000 PERSONS FROM TUBERCULOSIS. ENGLAND AND WALES, 1861–1920.

Year.	Pulmonary Tuberculosis.	Other Forms of Tuberculosis.	All Forms of Tuberculosis.
1861–1870	**249**	**77**	**326**
1871–1880	**213**	**75**	**288**
1881	183	70	253
82	185	73	258
83	188	71	259
84	183	74	257
85	177	66	243
86	174	73	247
87	162	66	228
88	157	65	222
89	157	69	226
90	168	70	238
Decennium, 1881–1890	**173**	**70**	**243**
1891	160	70	230
92	147	67	214
93	147	67	214
94	138	59	197
95	140	66	206
96	130	59	189
97	134	59	193
98	131	60	191
99	133	57	190
1900	133	57	190
Decennium, 1891–1900	**139**	**62**	**201**
1901	126	55	181
02	123	51	174
03	121	54	175
04	124	54	178
05	115	49	164
06	116	49	165
07	115	47	162
08	112	48	160
09	109	45	154
10	102	41	143
Decennium, 1901–1910	**116**	**49**	**165**
1911	106	41	147
12	102	35	137
13	99	36	135
14	102	34	136
15	114	37	151
16	116	37	153
17	123	39	162
18	132	37	169
19	98	28	126
20	87	26	113
Decennium, 1911–1920	**108**	**36**	**144**

PERCENTAGE OF RATE FOR EACH DECENNIUM ON RATE FOR 1861–1870.

	%	%	%
1861–1870	100.0	100.0	100.0
1871–1880	85.5	97.4	88.3
1881–1890	69.5	90.9	74.6
1891–1900	55.8	80.5	61.6
1901–1910	46.6	63.6	50.6
1911–1920	43.4	46.8	44.1

TABLE IV.

PULMONARY TUBERCULOSIS—DEATH RATES per 100,000 PERSONS.—VARIOUS COUNTRIES. 1881–1920.

Year.	Australia.	New Zealand.	England and Wales.	Scotland.	Ireland.	Netherlands.	Switzerland.	United States of America.	Jamaica.	Japan.
1881	122	95	183	210	195	196	199		184	Not available
82	132	86	185	215	201	197	209		171	
83	127	94	188	224	214	204	212		182	
84	135	90	183	209	213	203	205		185	
85	134	90	177	208	217	199	221		164	
86	126	86	174	207	218	197	221		173	94
87	124	90	162	191	213	177	200		159	93
88	122	79	157	181	204	186	212		153	100
89	116	82	157	180	209	194	210		165	106
1890	117	84	168	193	216	195	225		168	114
Decennium, 1881–1890	**125**	**87**	**173**	**199**	**210**	**195**	**211**		**170**	(5 years) **101**
1891	111	79	160	184	215	195	207		168	134
92	107	82	147	168	217	192	193		160	139
93	103	82	147	169	214	184	189		156	140
94	106	85	138	172	210	189	202		162	126
95	102	80	140	184	214	184	205		171	140
96	97	74	130	163	199	172	192		170	147
97	92	83	134	169	215	174	192		164	152
98	99	81	131	164	214	159	186		159	166
99	91	79	133	167	211	155	178		160	126
1900	91	76	133	166	225	164	203		160	133
Decennium, 1891–1900	**100**	**80**	**139**	**169**	**213**	**176**	**195**		**163**	**140**
1901	93	77	126	153	215	137	187	176	150	136
02	92	77	123	147	212	132	186	164	148	143
03	91	70	121	147	217	132	186	167	155	145
04	89	71	124	151	223	129	186	178	163	146
05	81	57	115	140	210	136	189	169	152	160
06	79	62	116	141	203	134	180	157	160	156
07	78	67	115	139	201	130	168	156	174	154
08	81	70	112	131	194	120	169	146	156	155
09	74	64	109	128	184	123	163	139	144	166
1910	70	59	102	115	172	118	161	140	156	164
Decennium, 1901–1910	**83**	**67**	**116**	**138**	**203**	**129**	**177**	**157**	**156**	**153**
1911	71	58	106	115	173	119	155	138	150	156
12	67	55	102	112	170	110	143	130	149	156
13	68	61	99	108	168	106	150	128	148	150
14	63	53	102	104	164	107	136	128		150
15	61	51	114	111	174	110	134	128		152
16	64	54	116	107	168	127	132	124		156
17	58	54	123	105	174	138	145	129		156
18	60	60	132	108	172	159	145	133		175
19	67	53	98	89	150	131	146	111		163
20	58	58	87	86	122	—	—	101		—
Decennium, 1911–1920	**64**	**56**	**108**	**104**	**163**	(9 years) **124**	(9 years) **143**	**124**	(3 years) **149**	(9 years) **157**

Not available.

—Not available.

PERCENTAGE OF RATE FOR EACH DECENNIUM ON RATE FOR 1881–1890.

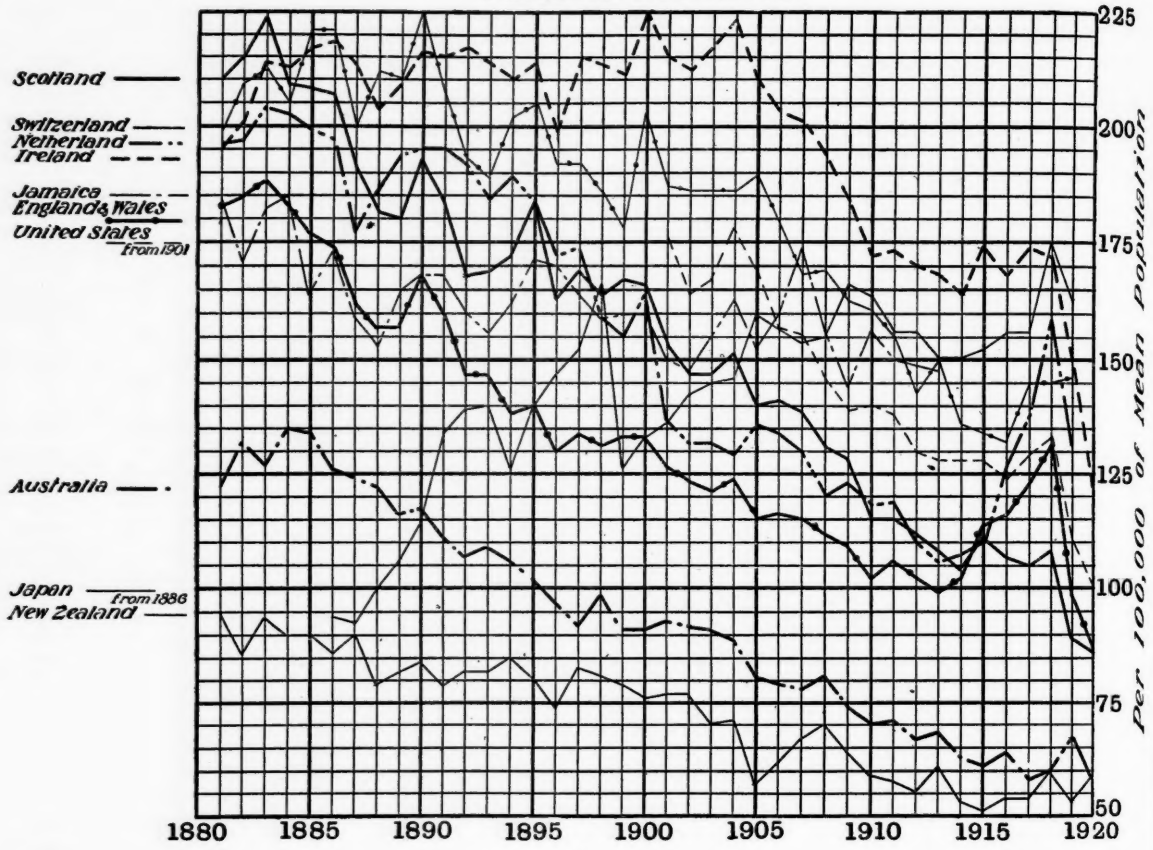
Year.	Australia.	New Zealand.	England and Wales.	Scotland.	Ireland.	Netherlands.	Switzerland.	United States of America.	Jamaica.	Japan.
	%	%	%	%	%	%	%	%	%	%
1881–1890	100.0	100.0	100.0	100.0	100.0	100.0	100.0	...	100.0	100.0[3]
1891–1900	80.0	92.0	80.3	84.9	101.4	90.3	92.4	...	95.9	138.6
1901–1910	66.4	77.0	67.1	69.3	96.7	66.2	83.9	100.0	91.8	151.5
1911–1920	51.2	64.4	62.4	52.3	77.6	63.6[1]	67.8[1]	79.0	87.6[2]	155.4[1]

[1] For nine years—1911–1919. [2] For three years—1911–1913. [3] For five years—1886–1890.

Table No 4

Death-rates from Pulmonary Tuberculosis

Various Countries



The contrast between this table and that for pulmonary tuberculosis is apparent. With the single exception of Brisbane all the cities have approximately the same mortality now and the same percentage reduction for tuberculosis other than pulmonary. Brisbane shows an astonishing feature presenting a 90.5% reduction in twenty years and the very low mortality figure of 3.5 per 100,000. It is obvious that the factors associated with pulmonary tuberculosis and tuberculosis other than pulmonary are of a different nature or a different order of magnitude.

Birthplaces of Persons who Died from Tuberculosis.

Tables XIIIa. and XIIIb. show the position of Australian nativity in respect of deaths from tuberculosis.

From the annual statistics issued by the Commonwealth Statistician, it appears that of deaths from tuberculous diseases in 1922 70.9% were deaths of persons born in Australia. This large preponderance, however, is misleading, as is seen from the two tables now under consideration. These two tables show the information in respect of the two census periods, distributing the deaths according to residence in proportion to the total living population grouped in the same periods of residence.

From these it is seen that the death rate per hundred thousand persons amongst those born in Australia is considerably less than the corresponding figures in each census year of all deaths from tuberculosis and is less than the rates for any residence period in both census periods with a single exception that in the 1920-1922 period the death rate amongst those resident in Australia between five and nine years was fifty-five as compared with sixty for those born in Australia.

It is clear from the tables that the Australian born show a much greater freedom from tuberculosis generally than those born abroad, but resident for longer or shorter periods in Australia.

Comparing Tables XIIIa. and XIIIb. it will be seen that the longer a foreign born person lives in Australia the more likely is he to die of a disease other than tuberculosis; comparison between the tuberculosis rates and the general rates for those resident twenty years and over, as compared with those resident less than five years, will make this apparent.

Comparison between Queensland and Victoria.

An endeavour was made to obtain information concerning the tuberculosis death rates in the tropical portions

of the Commonwealth as compared with the non-tropical regions, but this was not found to be practicable. A comparison between Queensland and Victoria, however, shows (see Tables XIV. and XV.) that the pulmonary tuberculosis death rate fell in Queensland from 154 in 1881-1882 to 41 in 1921-1922, while the corresponding figures in Victoria were 140 and 62, so that Queensland shows a fall from an initial figure higher than that for Victoria to a final figure lower than Victoria.

In "other forms of tuberculosis," Victoria shows a fall from thirty-three in 1881-1882 to eleven in 1921-1922, whereas for Queensland the similar figures are twenty-six and three.

The present figure for the death rate from "other forms of tuberculosis" in Queensland is thus seen to be at the extraordinarily low figure of three per hundred thousand and at every point in the comparison Queensland shows more favourably with regard to tuberculosis than does Victoria.

It is not possible to draw very extensive deductions from this comparison, but at least it justifies the deduction that the climatic influences are not operating to produce any abnormally high mortality from tuberculosis.

All the statistical material presented in this paper was supplied by the Commonwealth Statistician, whose assistance is here gratefully acknowledged.

TABLE Va.

PULMONARY TUBERCULOSIS—DEATH RATES per 100,000 PERSONS IN CERTAIN CITIES, 1881–1921.

Year.	Sydney.	Melbourne.	Brisbane.	Adelaide.	Perth.	Hobart.	Ballarat.	Bendigo.	Launceston.
1881	Not	227	190			...			...
82	avail-	231	236			178			156
83	able.	223	257			192			169
84	193	244	304			157			214
85	203	239	290			217			166
86	172	212	174			151			226
87	162	232	106			160			205
88	168	215	128			153			105
89	141	208	124		Not available.	122	Not available.	Not available.	105
1890	148	200	156			168			135
91	143	173	99			162			120
92	123	192	86			146			108
93	117	185	121			134			112
94	116	176	74			149			119
95	100	182	86			99			91
96	98	159	160	Not available.		70			84
97	88	161	120			124			114
98	107	169	139		111	78			98
99	101	135	125		102	72			62
1900	95	140	124		101	90			85
01	114	155	121		120	104	160	220	80
02	103	143	104		95	78	156	270	65
03	101	140	92		99	86	164	204	84
04	96	135	88		126	74	171	223	102
05	81	122	93		92	115	115	218	88
06	78	115	80		127	80	132	217	92
07	74	116	94	112	115	86	105	202	46
08	70	115	91	132	92	91	133	184	49
09	69	97	78	120	84	73	94	229	40
1910	72	97	72	111	93	59	110	228	64
11	69	99	88	112	96	45	94	195	21
12	57	100	76	115	109	24	100	177	38
13	65	88	97	110	104	88	109	200	50
14	56	89	74	*91	103	56	112	118	50
15	51	77	92	114	91	88	102	136	70
16	54	86	91	116	56	87	143	142	89
17	46	79	74	109	51	60	109	168	96
18	48	83	74	109	52	53	92	174	64
19	55	87	80	109	65	82	108	147	104
1920	51	79	74	101	56	65	106	171	87
21	49	81	66	101	69	96	70	142	71

TABLE Vb.

TUBERCULOSIS—OTHER THAN PULMONARY—DEATH RATES per 100,000 PERSONS IN CERTAIN CITIES. 1881–1921.

Year.	Sydney.	Melbourne.	Brisbane.	Adelaide.	Perth.	Hobart.	Ballarat.	Bendigo.	Launceston.
1881	Not	58	10			...			...
82	avail-	59	27			36			16
83	able.	52	64			80			6
84	61	54	80			31			...
85	67	58	100			13			11
86	82	64	70			16			...
87	73	65	81			22			26
88	72	64	49			38			29
89	65	68	54			54			60
1890	45	65	68			52			51
91	45	66	35			35			37
92	44	53	36			72			68
93	50	45	34			63			40
94	48	43	38			28			44
95	36	44	28			56			69
96	37	43	49			43			34
97	32	39	35			44			37
98	33	52	44		17	38			39
99	29	40	64		21	67			33
1900	18	43	39		14	35			33
01	19	44	35		28	38	34	66	24
02	24	39	44		28	43	46	42	47
03	20	42	27		25	23	33	35	38
04	22	44	17		19	63	53	52	46
05	19	39	16		15	34	32	39	28
06	17	39	18		18	45	23	25	46
07	21	34	9	28	22	48	18	20	97
08	20	26	5	20	28	58	21	13	69
09	17	26	10	26	24	40	19	32	28
1910	17	24	10	19	20	37	25	11	44
11	13	26	15	25	21	92	33	25	85
12	13	20	18	19	20	89	17	21	77
13	17	22	8	18	14	21	28	23	33
14	13	20	8	13	12	15	9	10	25
15	11	17	6	19	17	28	21	24	24
16	11	18	5	21	13	31	15	14	24
17	9	22	3	20	12	22	17	22	23
18	11	18	4	14	14	28	13	31	11
19	10	17	7	17	14	18	10	20	27
1920	12	19	4	15	18	16	20	12	23
21	10	19	3	18	13	16	13	21	15

Not available. (Perth)

Not available. (Ballarat)

Not available. (Bendigo)

Not available. (Adelaide)

TABLE Vc.

TUBERCULOSIS—ALL FORMS. DEATH RATES per 100,000 PERSONS IN CERTAIN CITIES. 1881–1921.

Year.	Sydney.	Melbourne.	Brisbane.	Adelaide.	Perth.	Hobart.	Ballarat.	Bendigo.	Launceston.
1881	Not	285	200			...			...
82	avail-	290	263			214			172
83	able.	275	321			272			175
84	254	298	384			188			214
85	270	297	390			230			177
86	254	274	244			167			226
87	235	297	187			182			231
88 ...	240	279	177			191			134
89	206	276	178			176			165
1890	193	265	224			220			186
91	188	239	134			197			157
92	167	245	122			218			174
93	167	230	155			197			152
94	164	219	112			177			163
95	136	226	114			155			160
96	135	202	209			113			118
97	120	200	155			168			151
98	140	221	183			116			137
99	130	175	189			123			95
1900	113	183	163			115	125		118
01	133	199	156			148	142	194	286
02	127	182	148			123	121	202	312
03	121	182	119			124	109	197	239
04	118	179	105			145	137	224	275
05	100	161	109			107	149	147	257
06	95	154	98			145	125	155	242
07	95	150	103	140		137	134	123	222
08	90	141	96	152		120	149	154	197
09	86	123	88	146		108	113	113	261
1910	89	121	82	130	113	96	135	239	108
11	82	125	103	137	117	137	127	220	106
12	70	120	94	134	129	113	117	198	115
13	82	110	105	128	118	109	137	223	83
14	69	109	82	104	115	71	121	128	75
15	62	94	98	133	108	116	123	160	94
16	65	104	96	137	69	118	158	156	113
17	55	101	77	129	63	82	126	190	119
18	59	101	78	123	66	81	105	205	75
19	65	104	87	126	79	100	118	167	131
1920	63	98	78	116	74	81	126	183	110
21	59	100	69	191	82	112	83	163	86

Not available. (Adelaide, 1881–1889)

Not available. (Perth, 1881–1889)

Not available. (Ballarat, 1881–1889)

Not available. (Bendigo, 1881–1889)

TABLE VI.

TUBERCULOSIS—DEATH RATE per 100,000 PERSONS.—AUSTRALIA. 1920–1922.

Age.	Pulmonary Tuberculosis			Other Forms of Tuberculosis			Tuberculosis, All Forms		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
Under 5 years	6	3	5	23	21	22	29	24	27
5– 9 years	3	2	2	8	7	8	11	9	10
10–14 „	3	6	4	7	4	6	10	10	10
15–19 „	25	38	31	5	6	6	30	44	37
20–24 „	63	78	71	9	7	8	72	85	79
25–29 „	92	88	90	9	8	8	101	96	98
30–34 „	94	80	87	8	7	7	102	87	94
35–39 „	107	79	93	9	7	8	116	86	101
40–44 „	122	74	98	6	5	6	128	79	104
45–49 „	147	60	105	6	8	7	153	68	112
50–54 „	130	53	94	9	6	7	139	59	101
55–59 „	139	57	101	8	7	8	147	64	109
60–64 „	135	47	94	10	4	7	145	51	101
65–69 „	115	51	85	8	7	8	123	58	93
70–74 „	79	35	58	10	4	7	89	39	65
75–79 „	73	29	51	7	7	7	80	36	58
80 and over	47	15	30	2	6	4	49	21	34
Not stated	30	5	19	8	...	4	38	5	23
All Ages	67	46	57	10	8	9	77	54	66

TABLE VII.

TUBERCULOSIS—DEATH RATES per 100,000 PERSONS—ENGLAND AND WALES. 1912–1914.

Age.	Pulmonary Tuberculosis			Other Forms of Tuberculosis.			All Forms of Tuberculosis.		
	Males	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
0– 4 years	34	29	32	172	141	156	206	170	188
5– 9 „	14	19	17	43	38	40	57	57	57
10–14 „	19	42	30	25	27	26	44	69	56
15–19 „	72	100	86	21	21	21	93	121	107
20–24 „	132	118	125	16	15	15	148	133	140
25–34 „	164	126	144	13	11	12	177	137	156
35–44 „	211	129	168	12	12	12	223	141	180
45–54 „	231	110	168	13	11	12	244	121	180
55–64 „	213	89	147	15	11	14	228	100	161
65–74 „	129	64	93	13	13	13	142	77	106
75–84 „	54	37	44	11	13	12	65	50	56
85 and over	19	18	18	7	7	7	26	25	25
All Ages	121	87	103	36	30	33	157	117	136

TABLE VIII.

TUBERCULOSIS AND OCCUPATION.—AUSTRALIA.—MALES.
DEATH RATES per 100.000 MALES IN EACH OCCUPATION—1910–1912 and 1920–1922.

Occupation.	1910, 1911, 1912.			1920, 1921, 1922.		
	Pulmonary.	Other Forms.	All Forms.	Pulmonary.	Other Forms.	All Forms.
Professional	102	8	110	119	8	127
Domestic	150	14	164	159	8	167
Commercial	108	9	117	106	9	115
Transport	87	7	94	82	4	86
Manufacturing	92	5	97	64	5	69
Building	85	6	91	76	5	81
Industrial	414	31	445	254	22	276
Agricultural	44	7	51	37	5	42
Pastoral	26	2	28	24	2	26
Mining	188	9	197	283	8	291
Other Primary Producers ...	24	2	26	21	1	22
Independent	163	9	172	116	16	132
Dependent	13	23	36	7	14	21
Undefined	96	13	109	227	38	265
Total Males	76	13	89	67	10	77

TABLE IX.

TUBERCULOSIS—ALL FORMS.—DEATH RATE per 100,000 MALES, ACCORDING TO OCCUPATION AND AGE.
AUSTRALIA—1911.

Age.	Total.	Professional.	Domestic.	Mercantile.	Transport and Communication.	Manufacturing.	Building and Construction.	Other Industrial.	Agricultural.	Pastoral.	Mining.	Other Primary Producers.	Independent.	Dependents.	Not stated.
Under 15 years ...	28	...	...	...	54	...	...	...	...	...	...	...	...	29	...
15–19 years ...	31	38	23	32	...	29	27	98	5	...	...	...	...	135	...
20–24 „ ...	74	123	86	113	72	69	45	258	23	15	8	...	...	616	19
25–29 „ ...	110	122	264	151	127	88	57	396	32	25	29	15	3,101	904	391
30–34 „ ...	129	201	238	179	185	93	110	518	51	21	138	18	1,143	...	176
35–39 „ ...	123	131	155	134	100	117	59	405	71	30	197	66	1,676	571	147
40–44 „ ...	170	171	344	137	143	172	79	646	74	37	293	25	1,709	1,563	278
45–49 „ ...	168	136	290	141	130	134	131	725	63	32	363	28	1,034	284	232
50–54 „ ...	152	57	162	151	164	92	115	526	81	48	388	...	531	340	333
55–59 „ ...	194	175	310	118	194	173	189	629	101	42	420	121	...	803	268
60–64 „ ...	173	67	51	162	175	213	126	474	91	37	578	...	211	...	66
65–69 „ ...	159	97	...	75	53	157	84	518	126	51	406	174	281	1,115	...
70–74 „ ...	145	83	...	82	512	45	203	600	109	...	467	...	59	...	...
75–79 „ ...	80	...	...	83	193	86	...	445	60	...	167	...	70	...	...
80 and over ...	57	...	...	67	...	...	190	317	103	...	...	193	...	...	...
Not stated ...	24	...	...	97	...	92	...	107	...	...	...	...	...	...	...
All Occupations	89	122	180	118	105	92	84	432	51	24	201	25	222	37	79

TABLE X.

PULMONARY TUBERCULOSIS—OCCUPATION—ENGLAND AND WALES—COMPARATIVE MORTALITY FIGURES OF MALES AGED 25-65 YEARS IN CERTAIN OCCUPATIONS. 1900–1902 and 1910–1912.

Occupational Group.	Comparative Mortality.		Occupational Group.	Comparative Mortality.	
	1900-'02	1910-'12		1900-'02	1910-'12
All occupied and retired males	187	141	Slaters, tilers	201	158
Civil service (officers and clerks) ...	129	95	Plumbers, painters and glaziers ...	213	147
do. (messengers, etc.)	160	102	Cabinet makers, furniture dealers ...	228	174
Clergymen	55	45	Sawyers	121	90
Barristers, solicitors	92	58	Woodturners, coopers	271	178
Law Clerks	251	180	Brick, tile, terra-cotta makers	76	73
Medical practitioners	65	64	Potters	285	232
Teachers	113	70	Glass manufacturers	283	182
Artists, engravers, architects	156	113	Chemical manufacturers	98	71
Musicians, music teachers	324	199	Chemists	149	93
Gamekeepers	72	54	Tallow, soap, glue manufacturers ...	126	72
Commercial travellers	168	120	Indiarubber workers	244	149
Commercial clerks ; insurance service...	202	172	Furriers, skinners	316	173
Railways :			Tanners	133	80
Officials, clerks	163	112	Curriers, leather goods makers ...	211	190
Engine drivers, stokers, cleaners ...	65	56	Saddlers, harness-makers	224	154
Guards, porters, etc.	114	86	Brush and broom makers	325	234
Coach, cab, omnibus service	230	175	Paper manufacturers	147	89
Coachmen, grooms	180	124	Printers	300	208
Carmen, carriers	173	144	Lithographers, copper and steel plate workers	261	111
Tramways	195	110	Bookbinders	275	213
Seamen, etc., merchant service... ...	262	257	Cotton manufacturers	197	120
Bargemen, lightermen	168	142	Wool, worsted manufacturers	159	124
Dock and wharf labourers	308	231	Silk manufacturers	219	126
Coalheavers	213	168	Hosiery manufacturers	225	176
Messengers, porters, watchmen... ...	384	252	Lace manufacturers	206	157
Farmers, graziers	76	56	Carpet, rug manufacturers	180	115
Agricultural labourers	90	70	Textile dyers, bleachers, etc.	193	139
Gardeners, nurserymen	88	76	Drapers, mercers	203	124
Fishermen	100	101	Hatters	280	181
Coalminers	89	75	Tailors	248	186
Iron miners	126	51	Shoemakers	271	222
Tin miners	816	678	Hairdressers	258	204
Lead miners	324	335	Milksellers, cheesemongers	99	96
Stone and slate quarriers	190	172	Butchers	182	126
Coal and coke merchants	96	78	Fishmongers, poulterers	166	117
Engine and boilermakers, millwrights...	163	131	Millers, cereal food manufacturers ...	129	92
(Boilermakers)	150	110	Bakers, confectioners	165	117
Tool, scissors, file, etc., makers... ...	369	306	Grocers	125	96
(File-makers)	387	434	Greengrocers, fruiterers	155	128
(Cutlers, scissors makers)	553	466	Maltsters	105	64
Gunsmiths	244	239	Brewers	248	181
Anchor and chain manufacturers, blacksmiths	158	116	Hotel keepers, wine, etc., dealers ...	271	196
Coppersmiths	162	146	Hotel servants	543	309
Lead manufacturers, leaden goods makers	165	191	Gas works service	141	119
Brass, bronze founders	272	233	Chimney sweeps	284	202
Shipbuilding	128	94	General shopkeepers	354	184
Cyclemakers	217	190	Hawkers, costermongers	554	419
Wheelwrights	142	87	Enginedrivers, stokers (not marine railway, agricultural or electric supply)	88	76
Ironmongers	135	95			

These numbers represent the number of deaths that would have occurred if the occupational death rates from pulmonary tuberculosis had been operating on a sample of the general male population enumerated at the Census of 1901, which, on the rates actually prevailing among that population, produced one thousand deaths.

TABLE XI.

PULMONARY TUBERCULOSIS AND OCCUPATION.
UNITED STATES—MALES.—1900.

DEATH RATES FROM PULMONARY TUBERCULOSIS per 100,000 OCCUPIED PERSONS, 10 Years of Age and over, in each Occupation.

Occupation.	No. of Deaths of Occupied Males, 10 years of age and over, from Pulmonary Tuberculosis per 100,000 males of the specified occupation.
Marble and Stone Cutters	541
Cigarmakers and Tobacco Workers	477
Compositors, printers and pressmen	436
Servants	430
Book-keepers, clerks and copyists	398
Labourers (not agricultural)	371
Tinners and tinware makers	365
Cabinet-makers and upholsterers	359
Musicians and teachers of music	350
Hairdressers	335
Sailors, pilots, fishermen	333
Painters, glaziers, varnishers	319
Leathermakers	311
Apothecaries, pharmacists, etc.	306
Coopers	300
Plumbers, gasfitters	294
Masons (brick and stone)	294
Butchers	288
Saloon and restaurant keepers	286
Livery-stable keepers and hostlers	268
Draymen, teamsters, etc.	261
Boatmen and canalmen	257
Brewers, distillers, rectifiers	257
Janitors and sextons	251
Hucksters and peddlers	251
Bakers and confectioners	250
All Occupied Males	**237**
Iron and steel workers	236
Carpenters, joiners	231
Engineers, firemen (not locomotive)	230
Leather workers	227
Tailors	218
Blacksmiths	213
Hotel and boarding-house keepers	210
Textile factory operatives	208
Millers (flour)	199
Machinists	196
Architects, artists, teachers of art, etc.	189
Journalists	188
Gardeners, nurserymen, vine growers	187
Physicians and surgeons	169
Merchants and dealers	164
School teachers	144
Lawyers	140
Policemen, watchmen, detectives	137
Bootmakers	136
Collectors, auctioneers, agents	131
Steam-railroad employees	130
Clergymen	124
Miners and quarrymen	121
Farmers, planters, farm labourers	112
Lumbermen and raftsmen	107
Bankers, brokers, and corporation officials	92

TABLE XIII.

DEATH RATES, ACCORDING TO LENGTH OF RESIDENCE IN AUSTRALIA, per 100,000 PERSONS.
1910–1912 and 1920–1922.

DEATHS FROM ALL CAUSES.

Length of Residence.	1910-'11-'12.			1920-'21-'22.		
	Males.	Females.	Total.	Males.	Females.	Total.
All Deaths	1,211	959	1,089	1,109	870	991
Born in Australia	816	693	755	835	677	755
Resident—						
Less than 5 yrs.	754	593	702	661	437	548
5–9 years	979	772	909	408	350	383
10–14 ,,	955	720	877	783	787	785
15–19 ,,	1,160	801	1,027	1,111	1,038	1,086
20 yrs. and over	3,257	3,136	3,205	3,509	3,505	3,507

DEATHS FROM ALL FORMS OF TUBERCULOSIS.

Length of Residence.	1910-'11-'12.			1920-'21-'22.		
	Males.	Females.	Total.	Males.	Females.	Total
All Deaths from Tuberculosis	89	77	83	77	54	66
Born in Australia	71	75	73	66	54	60
Resident—						
Less than 5 yrs.	119	94	111	99	65	82
5– 9 years	187	118	164	67	40	55
10–14 ,,	135	97	123	125	87	111
15–19 ,,	187	81	148	149	80	126
20 yrs. and over	140	75	112	117	50	89

TABLE XII.

DEATHS FROM TUBERCULOSIS, SHOWING TYPE AND SEAT, AND AGE. AUSTRALIA—1920–1922.

Type and Seat.	Total.			Under 5 yrs.		5–9		10–14		15–19		20–24		25–29		30–34		35–39		40–44		45–49		50–54		55–59		60–64		65–69		70–74		75–79		80 and over		Age not stated	
	M.	F.	Total.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Tuberculosis of Respiratory System:—																																					
Broncho-Pneumonia, tuberculous ...	28	19	47	2	7	...	...	...	...	1	...	2	2	2	1	...	2	5	...	4	...	3	...	2	2	6	1	...	2	1	1	..	1	...	...	...	...	...
Pneumonia, Tuberculous	20	12	32	...	...	...	...	1	...	2	1	1	2	2	1	2	1	1	1	...	...	6	...	2	3	2	...	...	2	...	1	...	...	...	...	...	...	...
Tuberculosis, without epithet	1,170	770	1,940	16	6	11	3	9	7	34	56	82	98	127	127	126	98	119	96	122	92	105	57	117	36	112	36	92	28	53	16	25	6	10	6	8	2	2	...
do., laryngeal ...	193	105	298	...	...	...	...	...	2	6	3	18	14	24	14	22	22	25	12	28	17	25	10	19	1	12	5	10	4	3	1	...	...	1	...	...	...	...
do., pulmonary ...	3,965	2,630	6.595	19	13	8	9	9	31	116	171	294	394	448	454	471	387	464	328	451	243	480	167	376	142	340	120	258	73	131	55	54	26	31	12	11	4	4	1
do., other forms, respiratory ...	12	9	21	...	...	...	...	...	...	2	...	...	3	1	1	...	1	2	...	...	...	...	1	1	2	2	...	1	...	3	...	...	...	...	...	...	1	...	...
Tuberculosis of Meninges and Nervous System:—																																					
Meningitis, tuberculous	328	276	604	154	142	52	47	33	16	14	27	19	15	14	9	14	8	6	6	8	2	1	2	3	...	5	2	3	...	...	...	1	...	...	...	...	1	...
Cerebral tuberculosis ...	2	2	4	1	...	1	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tuberculosis of Intestines and Peritoneum:—																																					
Enteritis, tuberculous...	17	15	32	1	...	1	2	...	...	1	2	1	1	1	1	2	2	...	3	1	2	1	...	4	1	1	...	1	...	1	...	1	1	...	...	...	...	...
Peritonitis, tuberculous	66	94	160	13	8	4	4	1	6	2	3	5	4	8	15	5	10	8	13	4	5	2	9	7	7	1	6	3	3	2	1	...	...	1	...	...	...	...
Tabes Mesenterica ...	15	15	30	9	8	2	1	1	2	1	1	...	1	1	2	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Tuberculosis, abdominal	10	11	21	3	5	2	...	...	...	...	1	1	1	...	...	1	1	1	1	...	...	...	...	1	1	1	...	...	...	...	1	...	...	...	...	...	...	...
do., intestinal ...	20	28	48	1	4	...	...	1	1	1	1	...	6	2	1	3	4	2	1	1	1	2	3	4	4	...	1	3	1	...	...	...	...	...	...	...	...	...
do., other	12	6	18	1	...	...	...	...	...	...	...	...	1	3	...	1	2	1	...	2	...	1	...	3	1	...	...	...	2	...	...	...	...	...	...	...	...	...
Tuberculosis of Spinal Column:—																																					
Psoas Abscess	10	2	12	1	...	2	1	...	...	...	...	...	...	1	1	2	...	...	...	...	...	2	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...
Tuber. Caries of Spine...	22	14	36	1	1	...	1	1	...	1	1	1	...	3	2	4	1	3	...	1	4	...	2	3	1	2	...	...	...	...	1	1	...	1	...	...	...	...
Tuberculosis, Spinal ...	54	33	87	3	2	2	2	3	2	4	1	10	5	4	4	5	4	5	2	4	2	1	3	1	...	6	3	4	1	...	1	1	1	1	...	...	...	...
do., Other	14	7	21	1	1	1	...	1	...	1	1	1	...	...	2	4	...	...	...	2	...	2	2	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...
Tuberculosis of Joints:—																																					
Arthritis, tuberculous...	7	2	9	...	...	2	...	...	...	...	...	2	...	...	...	...	1	...	1	1	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tuberculosis of Hip ...	40	17	57	2	1	3	...	5	2	4	2	4	1	5	...	1	1	4	...	...	...	3	2	1	...	1	3	3	...	3	2	1	1	...	2	...	...	...
Tuberculosis of Other Organs:—																																					
Bladder	14	6	20	...	...	...	...	1	...	...	...	1	1	1	...	...	1	3	...	3	1	2	...	1	1	1	1	1	...	...	...	...	...	1	...	...	...	...
Kidney	34	21	55	...	...	1	...	2	...	2	...	2	2	8	2	4	4	2	3	3	3	3	4	...	...	1	2	3	...	1	...	2	1	...	...	...	...	...
Other	53	40	93	4	4	1	1	3	1	1	4	7	4	6	5	1	3	10	3	2	2	2	2	2	1	5	2	...	1	6	3	2	...	...	1	1	3	...	...
Disseminated Tuberculosis:—																																					
Acute	68	93	161	1	1	1	2	1	...	8	14	11	20	11	15	5	11	7	10	5	3	5	6	5	4	4	5	2	1	...	1	...	...	1	...	...	...	1	...
Miliary	95	68	163	15	7	5	5	2	6	5	13	6	10	7	11	12	6	8	3	9	1	10	3	6	1	4	2	4	...	2	...	...	...	...	...	...	...	...
Other Chronic	74	53	127	14	6	4	3	5	6	5	2	5	10	4	9	7	4	8	3	2	4	4	1	7	2	3	2	3	1	...	...	1	...	1	...	...	...	1	...
Total	6,343	4,348	10,691	262	216	103	82	79	82	211	304	473	596	683	677	692	574	684	486	653	382	662	274	565	210	510	191	393	119	207	85	89	37	47	22	21	10	9	1

TABLE XIV.

DEATH RATE per 100,000 PERSONS FROM TUBERCULOSIS. VICTORIA, 1871-1922.

Year.	Pulmonary Tuberculosis.	Other Forms.	All Forms.
1871	114	32	146
72	116	32	148
73	123	35	158
74	130	37	167
75	130	48	178
76	127	42	169
77	135	38	173
78	137	34	171
79	127	30	157
1880	138	38	176
1881	138	33	171
82	143	33	176
83	133	30	163
84	146	32	178
85	145	36	181
86	140	36	176
87	153	38	191
88	145	35	180
89	144	41	185
1890	146	39	185
1891	129	42	171
92	136	34	170
93	134	29	163
94	131	27	158
95	132	30	162
96	121	30	151
97	116	31	147
98	128	35	163
99	113	31	144
1900	116	31	147
1901	118	31	149
2	117	26	143
3	111	29	140
4	111	31	142
5	102	28	130
6	99	27	126
7	96	21	117
8	96	20	116
9	85	19	104
1910	83	18	101
1911	84	19	103
12	80	15	95
13	75	16	91
14	72	14	86
15	66	14	80
16	71	13	84
17	64	15	79
18	66	14	80
19	71	11	82
1920	64	13	77
1921	67	12	79
22	58	10	68

TABLE XV.

DEATH RATES per 100,000 PERSONS FROM TUBERCULOSIS. QUEENSLAND, 1881-1922.

Year.	Pulmonary Tuberculosis.	Other Forms.	All Forms
1881	135	20	155
82	174	33	207
83	180	39	219
84	196	45	241
85	192	71	263
86	152	62	214
87	129	69	198
88	137	60	197
89	126	56	182
90	133	51	184
1881–1890	**153**	**53**	**206**
1891	126	44	170
92	104	44	148
93	115	47	161
94	105	42	147
95	96	33	129
96	99	36	135
97	91	30	121
98	90	35	125
99	85	37	122
1900	87	32	119
1891–1900	**99**	**38**	**137**
1901	85	37	122
2	90	32	122
3	78	27	105
4	79	18	97
5	75	15	90
6	67	13	80
7	63	10	73
8	62	10	72
9	58	9	67
10	51	8	59
1901–1910	**70**	**17**	**87**
1911	58	9	67
12	53	9	62
13	54	5	59
14	44	5	49
15	49	6	55
16	54	5	59
17	46	4	50
18	48	4	52
19	56	5	61
20	46	4	50
1911–1920	**51**	**6**	**57**
1921	44	4	48
22	39	3	42
1921–1922	**41**	**3**	**44**

PERCENTAGE REDUCTION OF EACH DECENNIUM ON RATE FOR 1881–1891.

	%	%	%
1881–1890	100	100	100
1891–1900	64.7	71.7	66.5
1901–1910	45.8	32.1	42.2
1911–1920	33.3	11.3	27.7
1921–1922	26.8		

THE INCIDENCE OF TUBERCULOSIS IN AUSTRALIA.

By W. J. Penfold, M.B., B.Hy.,

The subject has been investigated under the following headings:

(1) The prevalence of tuberculosis as found *post mortem;*

(2) The prevalence of tuberculosis as indicated by the positive von Pirquet reaction;

(3) The prevalence of tuberculosis in bovines, more especially in dairy herds.

The material for the first section has been forwarded by the pathologists of the Melbourne, Adelaide and St. Vincent's (Melbourne) Hospitals, and of the Children's Hospitals, Adelaide and Melbourne.

The data were collected by all these workers since the meeting of the last Congress and were handed over to me for analysis a duty which the President of the Section of Pathology desired that I should perform. In these analyses and in those of the second section of this paper I have been closely associated with Dr. Wheatland to whom I desire to express my sincerest thanks.

From the combined *post mortem* records of the general hospitals, it appears that approximately 25% of males and 22% of females show definite tuberculous lesions. The results obtained in the various hospitals are shown in Table I.

Beitzke, who has reviewed the whole literature, has estimated the frequency of tuberculous lesions in European adults at 70%.[1]

All the European figures are very much higher than the Australian figures herein recorded, and corroborate the relatively low tuberculosis death rate found in Australia, as against the high rates prevailing in Europe.

In Table II. the data are arranged with a view to showing the effect of country of origin on the frequency of occurrence of tuberculous lesions detected *post mortem.* From this table it will be seen that in the Melbourne Hospital patients 17.5% of those born in Australia show definitely tuberculous lesions, while only 13.7% of those born outside Australia show tuberculous lesions. On the other hand the Australian born showed a greater freedom from doubtful lesions which might have been tuberculous than was shown by the foreign born and in each case the percentage of doubtful lesions was so high that no final exact pronouncement on the prevalence of tuberculosis detected *post mortem* can be made until this doubtful group has been subjected to much closer scrutiny. If these doubtful lesions are in the main tuberculous, it may very well be that the Australian born and the foreign born inhabitants of Australia who come to hospital *post mortem* examination, have an almost exactly similar frequency of tuberculous infection. It seems highly likely that a large number of those in the doubtful category would have been included by Naegeli in his tuberculous persons, but even if the whole were included, the prevalence of tuberculosis in Australia would be very definitely smaller than that obtaining in Europe.

In the case of the Adelaide Hospital material (Table II.) the Australian born and the foreign born showed an identical percentage of definitely tuberculous lesions. Here, again, the Australian born showed a greater percentage of persons with entire freedom from lesions which might be tuberculous, while the foreign born showed a greater percentage of doubtful lesions.

In the case of St. Vincent's Hospital (Table II.) the numbers are small. If all the persons are taken together, we may conclude that those born in Australia show definitely tuberculous lesions a little more frequently than those born outside Australia and that those born within Australia show a slightly greater freedom from doubtful lesions, but the differences are so small that the *post mortem* evidence taken without consideration of the age grouping of the persons examined would not support the contention of the Commonwealth Statistician that fatal tuberculosis is very much less frequent in the Australian as against the foreign born.

TABLE I.

Percentage of Patients Showing Definite Tuberculous Lesions.

(Doubtful cases are not included in these numbers).

A. Melbourne Hospital Patients.

Of 343 male patients 81 or 23.6% showed definite tuberculous lesions.
Of 220 female patients 41 or 18.6% showed definite tuberculous lesions.

B. Adelaide Hospital Patients.

Of 129 male patients 34 or 26.4% showed definite tuberculous lesions.
Of 60 female patients 17 or 28.3% showed definite tuberculous lesions.

C. St. Vincent's Hospital Patients.

Of 13 male patients 6 or 46.2% showed definite tuberculous lesions.
Of 9 female patients 5 or 55.5% showed definite tuberculous lesions.
(The number of patients here is too small to be considered significant).

D. Total Patients included in A., B. and C.

Of 485 male patients 121 or 24.9% showed definite tuberculous lesions.
Of 289 female patients 63 or 21.8% showed definite tuberculous lesions.

E. Adelaide Children's Hospital Patients.

Of 23 male patients 2 or 8.7% showed definite tuberculous lesions.
Of 12 female patients 4 or 33.3% showed definite tuberculous lesions.

1. See Cobbett's monograph "The Causes of Tuberculosis (1917)" for a discussion of European statistics on this point.

TABLE II.

PERCENTAGE OF PATIENTS SHOWING DEFINITE TUBERCULOUS LESIONS.

(Arranged according to country of origin).

A. Melbourne Hospital Patients.

(a) Patients born in Australia.

Of 487 patients 85 or 17.5% showed tuberculous lesions.
285 or 58.5% showed no lesions which might be tuberculous.
117 or 24% showed doubtful lesions.

(b) Patients born outside Australia.

Of 204 patients 28 or 13.7% showed tuberculous lesions.
116 or 56.9% showed no lesions which might be tuberculous.
60 or 29.4% showed doubtful lesions.

B. Adelaide Hospital Patients.

(a) Patients born in Australia.

Of 87 patients 21 or 24.1% showed tuberculous lesions.
58 or 66.7% showed no lesions which might be tuberculous.
8 or 9.2% showed doubtful lesions.

(b) Patients born outside of Australia.

Of 79 patients 19 or 24% showed tuberculous lesions.
50 or 63.3% showed no lesions which might be tuberculous.
10 or 12.7% showed doubtful lesions.

C. St. Vincent's Hospital Patients.

(a) Patients born in Australia.

Of 27 patients 7 or 26% showed tuberculous lesions.
10 or 37% showed no lesions which might be tuberculous.
10 or 37% showed doubtful lesions.

(b) Patients born outside Australia.

Of 6 Patients 3 or 50% showed tuberculous lesions.
1 or 16.7% showed no lesions which might be tuberculous.
2 or 33.3% showed doubtful lesions.

D. Total Patients included in A., B. and C.

(a) Patients born in Australia.

Of 601 patients 113 or 18.8% showed tuberculous lesions.
353 or 58.7% showed no lesions which might be tuberculous
135 or 22.5% showed doubtful lesions.

(b) Patients born outside Australia.

Of 289 patients 50 or 17.3% showed tuberculous lesions.
167 or 57.8% showed no lesions which might be tuberculous.
72 or 24.9% showed doubtful lesions.

TABLE III.

MELBOURNE HOSPITAL POST MORTEM RECORDS.

1921-1922-1923.

Of 757 bodies 122 or 16.1% showed definite tuberculous lesions.
443 or 58.5% showed no lesions which might be tuberculous.
192 or 25.4% showed doubtful lesions.

(*A*) *Tuberculous Persons.*

Of the 122 tuberculous 85 or 69.7% were born in Australia.
28 or 22.9% were born outside Australia.
Of 9 or 7.4% no details of place of birth were available.

(The ages of the tuberculous persons varied from seventeen to ninety-eight years. The average was 47.4).

The average age at death of the Australian born tuberculous person was 44.1 years.
The average age at death of the non-Australian born tuberculous person was 57 years. Difference 12.9 years.
The average age at death of the tuberculous person of unknown geographic origin was 48.9 years.

(*B*) *Non-tuberculous Persons.*

Of 443 non-tuberculous 285 or 64.3% were born in Australia.
116 or 26.2% were born outside Australia.
Of 42 or 9.5% no details of place of birth were available.

(The ages of the non-tuberculous persons varied from eighty to eighty-eight years at their decease. The average age was fifty-one years).

The average age at death of those born in Australia was 46.4 years.
The average age at death of those born outside Australia was 60.6 years. Difference 14.2 years.
The average age at death of those of whom no details were available was 55.6 years.

In Table III. Melbourne Hospital *post mortem* records are dealt with in such a way as to show the relationship of age at death in the two groups of Australian and foreign born to the positively tuberculous condition.

The average age at death of the Australian born tuberculous person was 44.1 years, while the average age at death of the non-Australian born tuberculous person was 57 years. In the non-tuberculous cases, however, a very similar disparity in age is found. The average age at death in the case of the Australian born was 46.4, whereas the average age of death of the foreign born was 60.6 years, so that of the tuberculous, the foreign born died 12.9 years later, while of the non-tuberculous the foreign born died 14.2 years later. The probable explanation is that the average age of the foreign born of the whole population is very much higher than that of the native born of the whole population, excluding, of course, to a large extent children under thirteen or fourteen years of age, for they are not dealt with to any extent at the hospitals for adult, from which the figures under review have been supplied.

When the Adelaide Hospital records are reviewed from the same point of view (see Table IV.), somewhat different relations are seen to obtain.

Table V. deals with the portal of entry of the tuberculous infection. If the bronchial gland and lung infections are taken together, it is found that no less than 90.7% of the primary infections in adults occur in the respiratory system, while 7.9% of the primary foci were found in the alimentary system. These figures are very different from those obtained at the Melbourne Children's Hospital (see Table VII.) where the primary focus (in the cases where it could be determined) was in 67.8% respiratory and in 32.1% alimentary.

Table VI. shows the age distribution of the tuberculous and the non-tuberculous persons who came to autopsy in the various hospitals.

Chart I. shows the percentage of autopsies at which tuberculous infection was found at the different age periods in the combined records from the general hospitals devoted to the treatment of adults. The age distribution in the case of children will be shown in another chart,

TABLE IV.

ADELAIDE HOSPITAL POST MORTEM RECORDS.

Of 212 bodies 51 or 24% showed definite tuberculous lesions.
138 or 65.1% showed no lesions which might be tuberculous.
23 or 10.9% showed doubtful lesions.

(*A*) *Tuberculous Persons.*

Of 51 tuberculous 21 or 41.1% were born in Australia.
19 or 37.3% were born outside Australia.
Of 11 or 21.6% no details of place of birth were available.
(The ages at death of the tuberculous persons varied from eleven to eighty-six years. The average age was 53.2 years)
The average age at death of the Australian born tuberculous persons was 52.8 years.
The average age at death of the non-Australian born tuberculous persons was 54.5 years. Difference 1.7 years.
The average age at death of the tuberculous persons of unknown geographical origin was 51.4 years.
(The average length of residence in Australia of cases born outside Australia was twenty-two years).

(*B*) *Non-tuberculous Persons.*

Of 138 non-tuberculous 59 or 42.8% were born in Australia.
49 or 35.4% were born outside Australia.
while of 30 or 21.8% no details of place of birth were available.
(The ages at death of the non-tuberculous persons varied from seven to eighty-seven years. The average age was 48.6 years).
The average age at death of those born in Australia was 39.9 years.
The average age at death of those born outside Australia was 58.8 years. Difference 18.9.
The average age at death of those of unknown geographical origin was 49.5 years.
(The average length of residence in Australia of cases born outside Australia was 33.7 years).

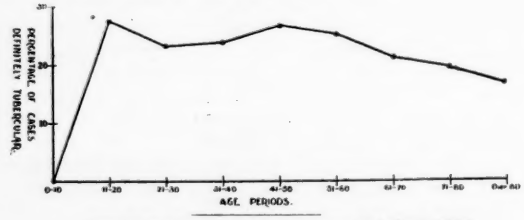
TABLE V.

MELBOURNE, ADELAIDE AND ST. VINCENT'S HOSPITAL PATIENTS.

In 102 definitely tuberculous male patients the presumed primary focus was in the lungs in 89 or 87.25%.
49 definitely tuberculous female patients the presumed primary focus was in the lungs in 40 or 81.6%.
102 definitely tuberculous male patients the presumed primary focus was in the bronchial glands in 5 or 4.9%.
49 definitely tuberculous female patients the presumed primary focus was in the bronchial glands in 3 or 6.1%.
102 definitely tuberculous male patients the presumed primary focus was in the mesenteric glands in 6 or 5.9%.
49 definitely tuberculous female patients the presumed primary focus was in the mesenteric glands in 5 or 10.2%.
102 definitely tuberculous male patients the presumed primary focus was in the liver in 1 or 1.0%.
102 definitely tuberculous male patients the presumed primary focus was in the vertebral column in 1 or 1.0%.
49 definitely tuberculous female patients the presumed primary focus was in the endometrium in 1 or 2.0%.

but from the chart now under review it is seen that in the 11-20 age period the greatest percentage prevalence of tuberculosis is found *post mortem* and that thereafter there is a slight fall in prevalence in the age periods 21-40. A second maximum occurs at the age period 41-50, and then a continuous fall until the end of life. This graph is founded on such a large number of *post mortem* examinations as to give us fairly reliable information, except at the highest and lowest age periods.

The relative frequency of infected to non-infected bodies as found at the individual hospitals is shown in Charts II., III. and IV. These graphs show actual numbers of cases and not percentages. The Melbourne Hospital and the Adelaide General Hospital results show a slight similarity in the age distribution of the cases.



Graph to show the percentage of autopsy cases which showed definite tuberculous lesions.

Melbourne, Adelaide & St Vincent's Hospital cases. Doubtful cases omitted.

CHART I.

Table VII. deals with an analysis of 326 *post mortem* examinations in the Children's Hospital, Melbourne, between 1920 and 1922. From this table it is seen that the highest percentage of tuberculous infection amongst the total number of patients coming to autopsy is obtained during the age period 1-3.

Determination of the types of tubercle bacilli prevailing in the Children's Hospital material examined at the Commonwealth Serum Laboratories has shown that this period corresponds with the period of maximum prevalence of bovine tuberculosis. The other age periods show such a small number of total deaths that it has not been possible to construct a graph with a reasonably smooth curve without grouping several years together.

TABLE VIII.

Age Incidence of Tuberculosis found *Post Mortem* at the Children's Hospital, Melbourne.

Age Group (years)	Number of Children	Number of Tuberculosis Children	Percentage
Up to 1	144	6	4.2
1-3	74	17	23
3-10	78	15	19.2
Over 10	29	5	17.2

TABLE VI.
AUTOPSY RECORDS.

Autopsies performed at Melbourne Hospital.

Lesions.	Age Periods (years).									
	0–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100
Tuberculous	0	8	20	14	24	27	21	7	0	1
Non-tuberculous	1	23	51	58	80	83	89	48	7	0

Autopsies performed at Adelaide Hospital.

Lesions.	Age Periods (years).								
	0–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90
Tuberculous	0	3	1	9	11	7	9	8	1
Non-tuberculous	2	9	17	23	18	21	28	13	3

Autopsies performed at St. Vincent's Hospital.

Lesions.	Age Periods (years).						
	0–10	11–20	21–30	31–40	41–50	51–60	61–70
Tuberculous	0	2	0	2	2	2	2
Non-tuberculous	0	2	1	0	4	3	1

Autopsies performed at Melbourne, Adelaide and St. Vincent's Hospitals.
Percentage of persons definitely tuberculous.

Tuberculosis.	Age Periods (years).								
	0–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	Over 80
Percentage	0	28	23	24	27	25	21	20	17

Autopsies performed at Adelaide Children's Hospital.

Lesions	Age Periods (years).										
	Under 1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10–11
Tuberculous	0	1	0	1	1	0	1	0	0	1	1
Non-tuberculous	12	2	4	2	2	1	1	2	2	1	0

This has been done in Table VIII. and from this it will be seen that in children over three years of age about 18.2% of the total number of autopsies reveal tuberculous infection of the cadaver. The figures for Edinburgh and London, ascertained by Shennan, and by Eastwood and Griffith respectively, are very much higher.[1]

The Melbourne Children's Hospital figures are shown on Chart V.

Chart VI. shows the age distribution of the tuberculous and the non-tuberculous as found *post mortem* at the Adelaide Children's Hospital.

[1] Cobbett's monograph on "The Causes of Tuberculosis (1917)."

Conclusions.

(1) About 25% of adult males and 22% of adult females coming to autopsy in Australia show definite tuberculous lesions.

(2) The frequency of tuberculous lesions found *post mortem* in Australia is very similar in those born within and those born outside Australia.

(3) The average age of the foreign born adults who

TABLE VII.
ANALYSIS OF POST MORTEM FINDING AT THE CHILDREN'S HOSPITAL, MELBOURNE.
*Classification with regard to age grouping and the ratio of Tuberculosis to all other diseases.**

Cause of Death	Age Groups (years).														
	Up to 1 year	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10–11	11–12	12–13	13 & over	Age unknown	TOTAL
Number of deaths from Tuberculosis	6	9	8	1	6	4	2	–	–	2	2	–	3	–	1	44
Number of deaths from other diseases	138	36	21	9	8	6	13	15	8	4	2	7	10	5	–	282
Percentage incidence for the tuberculosis group	13·63	20.45	18.18	2.27	13.63	9.09	4.54	–	–	4.54	4.54	–	6.81	–	2.27	99.95 (approx.)

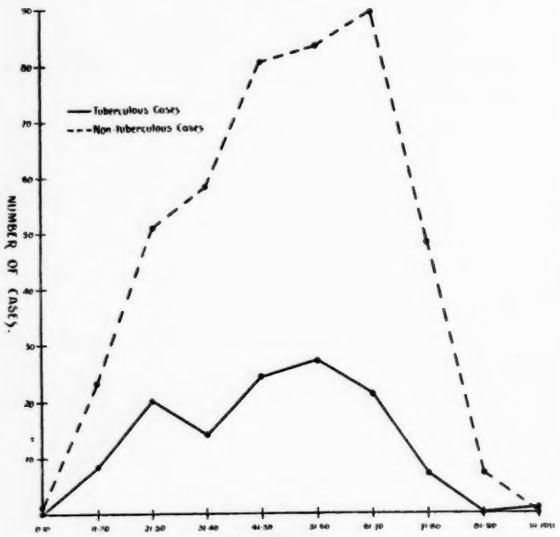
Probable mode of entry of Tuberculosis according to age groups.

Route of Entry	Age Groups (years)															
	Up to 1 year	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10–11	11–12	12–13	13 & over	Age unknown	TOTAL
Respiratory	3	4	3	1	3	2	–	–	–	–	1	–	2	–	–	19
Alimentary	1	2	3	–	–	2	–	–	–	1†	–	–	–	–	–	9
Indefinite	2	3	2	–	3	–	2	–	–	1	1	–	1	–	1	16
	6	9	8	1	6	4	2	–	–	2	2	–	3	–	1	44

*Based on 326 post mortem examinations conducted between October 9th, 1920, and October 27th, 1922.

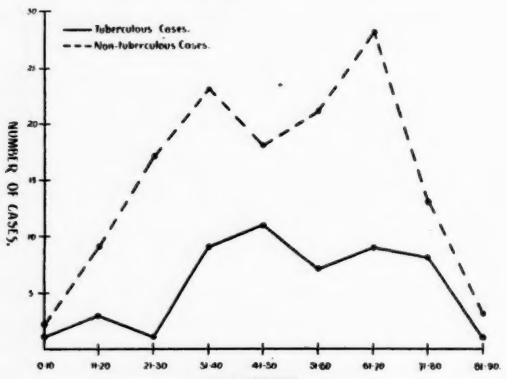
†In this patient, on *post mortem* examination, a condition of tuberculous peritonitis was found, with no other tuberculous lesions. In one other case the age of the child was not stated; this case is therefore not included in the age groups, but is included in the total number of tuberculous infections, and also in the percentage ratio figures for tuberculosis under special heading.

die in Australia showing tuberculosis *post mortem* is greater than that of the similar group which is Australian born. This is probably due to the higher average age of the foreign born adult population.



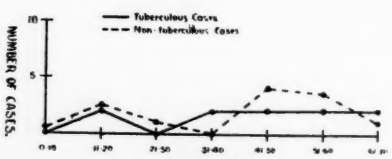
Graph to show the numbers of definitely tuberculous & non-tuberculous cases occurring in various age periods.
Autopsies performed at Melbourne Hospital. Doubtful cases omitted.

CHART II.



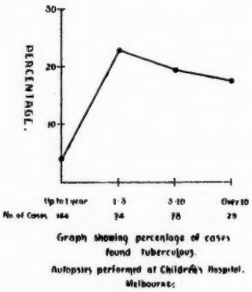
Graph to show the numbers of definitely tuberculous & non-tuberculous cases occurring in various age periods.
Autopsies performed at Adelaide Hospital. Doubtful cases omitted.

CHART III.



Graph to show the numbers of definitely tuberculous & non-tuberculous cases occurring in various age periods.
Autopsies performed at St Vincent's Hospital. Doubtful cases omitted.

CHART IV.



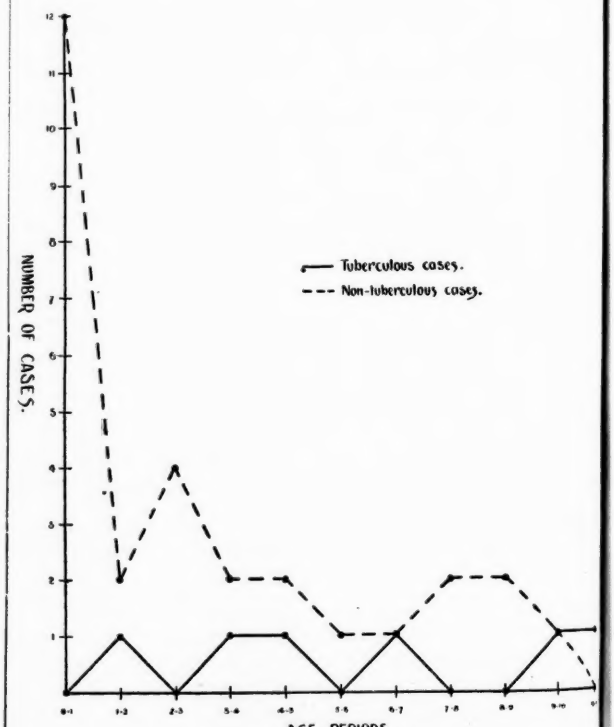
Graph showing percentage of cases found tuberculous.
Autopsies performed at Children's Hospital, Melbourne.

CHART V.

(4) About 90% of the primary tuberculous lesions in Australian adults and 67% of those in children are found in the respiratory system.

(5) The *post mortem* frequency of tuberculosis is greatest in the age-period eleven to twenty years; a second maximum occurs in the age-period forty-one to fifty years and thereafter falls throughout life.

(6) In children tuberculosis is very infrequently (4.2% of cases) found in the first year of life. The incidence in the age-period one to three years is 23% and after that about 18%.



Graph to show the numbers of definitely tuberculous & non-tuberculous cases occurring in various age periods.
Autopsies performed at Adelaide Children's Hospital. Doubtful cases omitted.

CHART VI.